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WHAT TV REPAIRS SHOULD COST

Don't be overcharged! Know the fair price of specific TV repairs; know how to tell if your set really needs repairs; know how to judge a repairman's honesty and competence

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TV REPAIRS— A DIM PICTURE

☐ For better or worse, the television set is the focal point of much family entertainment today, and if your family is typical, you probably spend a good deal of time in front of it. ☐ When the screen goes blank, you place a hurry-up call to the serviceman. When he gets there, you nervously watch him work, hoping the bill won't be too high—that you won't be overcharged for whatever it is that he is doing. But without technical know-how, you can't be sure whether or not you're being "taken."

THE TV SERVICEMAN is well aware of the important role that the set plays in most homes. If he is a responsible, honest businessman, he will answer your call as quickly as possible, make only the necessary repairs, and charge a fair price for his efforts. ☐ If, on the other hand, he wishes to take advantage of the situation, he can exaggerate the set's ills, perhaps replacing parts that do not need replacement. He will present you with a greatly padded bill, assuming that, in all probability, you will gladly pay to have your set operating again. Unfortunately, this latter attitude seems to be predominant in the TV repair field today.

RECENTLY, a major TV network sponsored an admittedly limited test in a large metropolitan area. A number of identical sets, each with the same bad tube, were distributed to participants who then called in TV servicemen for repairs. ☐ The results were appalling. Only 15% of the men presented what might be described as an honest bill for the service performed. Another 15% were borderline cases, in which the servicemen replaced parts that may not really have needed replacing, and charged accordingly. ☐ The remaining 70% were clearly dishonest in overcharging greatly for the work performed. The average overcharge, based on the cost of parts and labor actually required, was about 150%. One man presented a bill almost 400% over what it should have been.

OTHER TESTS have produced similar results. The Attorney General of Illinois checked out some 25 to 30 shops selected at random in the Chicago area, again with sets having one or two known defective tubes. As a result of this test, no fewer than 10 of the shops were charged with deliberate fraud. ☐ Some of the cases, according to investigators from the Attorney General's office, were flagrantly dishonest.

Some repairmen intentionally damaged parts of the sets, then replaced the parts. At least one man, preying on the assumed ignorance of his customer, charged for repairing a part that didn't exist in that particular set!

MANY OTHER similar tests are on record, with similarly unsavory results. Overcharging seems to be the rule, rather than the exception. Many other dishonest practices—charging for work not done, or for parts not actually replaced—are also widespread in the field. □ What can you do to protect yourself? Most important is an awareness of the age-old adage Caveat emptor. Let the TV service buyer beware!

WE WOULD LIKE to stress here and now, once and for all, that this book is in no way intended to be an indictment of the entire TV repair business. Some of our best friends are TV servicemen! □ But the very popularity of television and the consequent demand for service has attracted some characters of questionable ethics. And it must be admitted that the temptations to fleece the ignorant are great. □ But knowledge (which it is the purpose of this book to impart) will go a long way toward assuring a fair understanding between you and the man who is servicing your TV set.

HOW TO SELECT A TV SERVICEMAN

□ When your TV set develops trouble, what do you do? If you're a person with ten thumbs, you call for a serviceman immediately. If you have even the slightest mechanical inclination there are some things you can check out first. □ It may be a simple misadjustment of some control that is causing the problem. Or an easily replaced tube could be at fault. These do-it-yourself possibilities will be covered in later chapters. For now, let's assume that it is necessary to call a repairman.

THE WISE SET OWNER has prepared in advance for this contingency. Just going to the phone book or the classified section of a local newspaper and selecting a name at random is not the way to insure your finding a service shop with whose work you'll be satisfied. □ If possible, check with neighbors for recommendations on repairmen with whom they've been well satisfied. Call a few service shops before you need them, inquiring about their rates for house calls, labor, estimates and so on. Ask how long they guarantee their work. □ When

practical, it's a good idea to visit the shop. Does it appear relatively neat and well-organized? (Of course, the very nature of the business means that there will be a certain amount of clutter.) Does it appear to be a busy shop? Are there enough people employed to keep the work moving? Is the person in charge willing and able to answer your questions about charges, types of work performed, and guarantees? (If he seems devious or reluctant to discuss these things with you now, what will he be like when he actually has your set in his shop?)

ANOTHER WISE PRECAUTION is to check out a particular shop with the local Better Business Bureau and/or Chamber of Commerce. While they may not actually recommend anyone to you, they will tell you if there have been complaints about an individual or a shop by other customers who have been stung.

A GREAT NUMBER of TV repairmen are simply "tube jockeys." Such a man will come to your house, armed with limited knowledge gained from do-it-yourself books or study courses, and prepared to replace the tubes that are at the root of most TV troubles. If that clears up the problem, fine. If it is anything more involved, he will take your set to his

"shop." □ Actually, he takes it to a large repair shop. When he returns the set, you pay (unknowingly, of course) the bill of the large shop, plus an extra 10 or 15% (or more) to the man simply for pickup and delivery of your set. It would, of course, have been cheaper for you to take in the set yourself. In fact, if you had called the large shop in the first place, it may not even have been necessary to remove the set from your home. □ Before choosing a TV serviceman, make certain he has a shop of his own in which to tackle serious repairs.

SHOULD YOU let your brother-in-law do it? Or the man next door, or the fellow in your office who likes to fool around with those electronic things? Maybe. □ If it's a simple matter of tube replacement, and you're reluctant to try it yourself, you may be able to let an amateur put your TV set in top working order and be reasonably sure that he'll give you a break, charging you a minimum for parts and only a few dollars—or even a few beers—for his time. □ But remember that you may be asking for trouble. If his competence isn't up to his confidence, he might turn a minor problem into a major one. So be wary. Make sure he knows what he's doing before you let him do it to your set. Let him experiment on his own set before tackling the problems of your set!

MANY MAJOR set manufacturers have "authorized" service shops. This means, in theory at least, that a shop with this authorization is backed by the reputation of the manufacturer. In the case of a relatively new, malfunctioning set that is under warranty, the owner would be referred to an authorized shop for repairs. □ In most cases, the serviceman is required to return replaced parts that are under warranty to the manufacturer. This discourages the replacement of good parts. In the case of older sets that do not have warranty protection, the meaning of this authorization to the set owner is less clear. It may be assumed that such a serviceman is particularly well versed in what might go wrong with the given brand set. But beyond that, it's up to the customer to protect himself. □ In most cases, a set owner complaining to the manufacturer about dishonest practices on the part of a serviceman will be told to pursue his complaint through other channels (which will be discussed in a later chapter). If the claim is proven, the company may possibly revoke the authorization of the shop. But the burden of proof, and of carrying forward the complaint, is definitely on the customer—usually a long, troublesome process.

SEVERAL CITIES and a few states have licensing regulations governing TV repairmen. Your

local Chamber of Commerce or Better Business Bureau can probably advise you as to what regulations exist in your community, and what protection these afford you. Licensing usually assures that the repairman knows how to service your set; it doesn't necessarily mean that he will be honest about it. □ In a few instances, the licensing bodies make a practice of vigorous policing against cheats—but these are rare. In most cases, the burden of proving that you have been cheated rests on you. And this is seldom easy to prove, unless you have technical competence in the field, in which case you probably wouldn't have called in a repairman in the first place.

ALL THIS may seem like a lot of effort to expend before you even settle on a TV serviceman. But dealing with a competent, honest shop can save you many dollars over the life of your set. And, perhaps even more important, a very great deal of aggravation.

WHEN YOU DO have trouble and call the serviceman, be as specific as possible. Just saying "My set is dead" doesn't tell the story. First of all, localize the trouble to picture, sound, or both; missing or improperly functioning. If the picture tube lights up but has no picture on it, this is called "raster" and should be reported

to the serviceman over the phone. □ Tell him, too, the make of the set, and, if possible, the model number (this can usually be found somewhere on the back of the set). This will enable him to consult his service manuals before he comes to your house, and to make sure that he brings a supply of the parts peculiar to your set that are likely to be causing the problem.

ANOTHER HELPFUL BIT of identification nomenclature concerns horizontal and vertical. The circuits that drive the picture left and right across the screen are horizontal circuits. If your set shows only a vertical white line across the screen, you have horizontal troubles. □ The vertical circuits move the picture up and down the screen. Tell the serviceman the condition of your screen so that he can be prepared with the right remedy.

THE REPAIRMAN who shows up at your house without tools or spare tubes, wanting to take your set to his shop without even attempting to solve the problems on the spot, should be shunned. Most troubles can be cured right in your home. Letting the set out of your sight automatically jumps the price. Even if an honest repairman takes it to his shop, he has to charge for pickup and delivery. Make sure that you are convinced that the trouble cannot

be cured at home before letting anyone take your set away. □ Certain symptoms almost always indicate that the trouble can be cleared up simply by inserting one or two new tubes, or by a minor adjustment to the set or the antenna. Such repairs should be done in the home, not in the shop. If your set manifests any of the following symptoms, don't let the serviceman take it out of the house without first checking it out thoroughly.

- Screen lit, sound normal, picture rolling.
- Raster present, sound normal.
- Picture width normal, height diminished.
- Picture height normal, width diminished.
- Picture too small both horizontally and vertically.
- Sound normal, but only thin horizontal line across picture tube.
- Sound normal, picture rolling vertically and moving horizontally.

On color sets:

- Set shows only black and white.
- Color not constant.
- Color washed out.
- Screen shows one color with black and white picture.
- Colored outline with black and white picture.
- Splotches of color on black and white picture.
- Colored snow on black and white picture.

ASK FOR A diagnosis and a price estimate before you let any serviceman take your set away. If he can't pinpoint the trouble, ask him to call you with an estimate before doing any repair work. Don't sign an authorization for him to do work unless you know specifically what he will do, and how much it will cost. ☐ A reputable service organization will be happy to provide you with these safeguards, for it protects their reputation, too.

IF YOUR SET must be taken away, make sure that the man has a shop and that you know where it is located. Believe it or not, there have been cases where TV sets have simply disappeared when careless owners let somebody walk off with them without knowing where they were being taken. If the set must be taken to the shop, have the serviceman specify when it will be returned. And get a receipt for it. ☐ Whether your set is repaired at home or taken to the shop, insist on an itemized bill that clearly identifies all parts that have been replaced. Any warranty or guarantee on repairs and new parts should be clearly spelled out in writing. Ask the serviceman to return to you any tubes or other parts he has replaced. ☐ Of course, parts replaced under a new-set warranty will usually have to be returned to the manufacturer by the serviceman.

HOW MUCH SHOULD YOU PAY?

☐ Exactly how much you will have to pay for TV repairs depends on a number of variable factors. The greatest variable is the cost of labor in that part of the country where you live. ☐ Too, there is a "what the traffic will bear" factor. Generally, the resident of Park Avenue in New York expects to pay more for such service than does the factory worker over in Brooklyn. That's the way things are!

WHEN THE SERVICEMAN comes to your home, you are liable for a service charge, ranging anywhere from $3 to $10, with an average around $5. This pays him for coming in answer to your call. Over this charge, there are additional costs for replacement parts, labor (paid for by the hour or part thereof), or for moving the set from your home to the shop and back.

THE SERVICE CHARGE sometimes, but not always, includes part of the labor charge—say, the first half hour. From $3 to $5 for each additional half hour of labor is a fair charge. Don't feel that $10 an hour is exorbitant for a com-

petent, conscientious serviceman. After all, he has to figure time spent traveling to and from your house, too. And, just as when you go to a doctor, you are paying for the man's training as well as for his time.

FOR AN ESTIMATE of work to be done, you can expect to pay the basic service charge, though some shops advertise free estimates. □ When a set must be taken to the shop, the charge for pickup, delivery, installation and adjusting is about $7.50 to $10, often depending on how much work was done in the shop.

A GENERAL CHECKUP done in the shop for diagnosis or analysis of the set's performance will include cleaning, testing of tubes, checking alignment and circuitry, and will cost from $10 to $15. Charges for installing new parts and for labor involved in this are extra.

GENERALLY, SHOP WORK will be charged at $5 to $8 per hour, with a minimum of $3.50 for a half hour. Some shops have flat labor rates for various jobs. For example, installing or repairing a built-in antenna may run from $3 to $5 (exclusive of parts). □ Cleaning the controls should be about $3. Installing a resistor or capacitor may cost $1, while installing a new tuner may run $12.50 to $15 (again, exclusive of

parts). As stated previously, it is wise to check with your serviceman about charges before you commit your set to his care.

THE LABOR CHARGE for installing an outdoor antenna will probably run $20 to $35, unless there is some special problem, such as having to fish wires between walls, in which case you will usually be charged an additional hourly rate. Antenna repair work is charged at the normal hourly rate for service calls.

IF ALL YOUR SET needs is an adjustment, the serviceman can only charge you for the service call, plus any additional time he spends working on the set. Chances are that, if he's any kind of a businessman, he'll check the tubes and probably replace a few. The serviceman buys tubes and other parts at a considerable discount; you pay list price. □ This is legitimate profit, and you have no cause for complaint as long as you are not paying over list for the parts. (A later section of this book tells how you can take advantage of these discounts by buying your own tubes.)

THE MOST COMMON replacement parts in a TV set are tubes. It would be impossible to publish in a book of this size, list prices for all tubes. What we have done is to compile a list

of many of the more commonly used tubes along with their approximate list prices. We suggest that you refer to this as a general guide to what your serviceman might charge for the tubes he replaces in your set.

1A5GT	$4.00	6GF5	$3.45
1B3GT	$2.75	6H6	$4.25
1DN5	$3.45	6J6	$2.65
3AL5	$1.95	6K6GT	$2.45
3AU6	$2.20	6SN7GTB	$2.45
3BN4A	$2.85	6T4	$5.15
3BN6	$3.60	6T8A	$3.10
3S4	$3.40	6V6GT	$2.05
5AS4A	$3.45	6W4GT	$2.25
5AU4	$3.65	6X5GT	$2.10
5T8	$4.15	6Y6GT	$3.55
5U4G	$1.95	12AT6	$1.75
5Y3GT	$1.60	12AT7	$2.85
6AF4	$3.65	12AU7	$2.35
6AF6G	$4.25	12AV7	$3.35
6AG5	$2.85	12CA5	$2.85
6AL5	$1.75	12CN5	$3.25
6AU6	$1.95	12DS7	$4.05
6AV6	$1.60	12SN7GTA	$2.55
6AX4GT	$2.50	25AX4GT	$3.05
6BG6G	$6.00	25BQ6GTB	$4.40
6BQ6GT	$4.00	25L6GT	$2.75
6CB6	$2.10	25W4GT	$2.55
6CD6G	$5.45	25W6GT	$3.40
6F6GT	$5.75	25Z5	$4.35

OTHER PARTS of your set that are likely to show up on the repairman's bill include resistors (25¢ to 50¢), capacitors (25¢ to $1.75), and fuses (about 30¢ to $1.50). □ The most expensive individual part of all is, of course, the picture tube. Price variation is great here, depending on your set's size, quality and other factors. You might get a new black and white picture tube for as little as $30 to $35, or you may have to pay as much as $135. But the average is probably somewhere around $40 to $50. For a new color picture tube, you can expect to pay from $125 to $300, again depending on what your particular set calls for. □ Since the serviceman's mark-up on picture tubes is considerably more in terms of dollars and cents than it is on other parts, he may be willing to reduce the price.

THE PRICE VARIATION on outdoor antennas is even greater than on picture tubes. You can buy one for as little as $10 plus installation, or you can pay over $200—even more if you are in a far-out area where an antenna tower must be built. □ Here we'll have to leave you on your own, except to mention that many discount stores as well as electronic supply houses sell antennas at considerably less than you would have to pay for one from a TV man. It may be possible for you to buy your own and hire someone to install it for you.

THE WARRANTY ON YOUR TV SET

☐ The warranty that accompanies a new TV set provides a certain amount of protection for the buyer—but it's written in very fine print, with the limitations far more clearly defined than the guaranties! ☐ A typical warranty states that the manufacturer will provide a replacement part at no cost during a given period after the purchase of a new set. For example, picture tubes are generally warrantied for one year; other parts for 90 days.

THE LABOR INVOLVED in replacing these parts is another matter, however, as are shipping charges incurred in sending the defective parts back to the manufacturer. The dealer who sold you the set may guarantee it for a given period, with labor included in his guarantee. Or he may not. ☐ Generally, the warranty provides that any work done on the set under its terms must be done by a franchised or authorized service shop. If work on the set is done by anyone else, it may void the warranty. So read your warranty, but don't expect it to save you from worrying about TV repair costs!

THE TRICKS OF THE TV TRADE

☐ Every trade has its tricks, and the unethical TV repairman has a number of them on which he relies. Even the generally honest serviceman may sometimes feel compelled to resort to some questionable practices.

FOR EXAMPLE, experience has taught him that presenting a bill for $10 labor when replacing a 25¢ capacitor will usually bring howls from his customers, who simply can't understand that it has taken him 2 or 3 hours to find the source of the trouble. So he may lower the labor price to $7.50 and up the parts cost to $2.75, trusting in the customer's ignorance of the true cost of the capacitor. ☐ Or he may add to the bill the cost of parts he never touched. More likely, he'll still charge $10 labor, but tack on a larger parts cost so that the customer is less likely to question the labor charge.

JUGGLING AND PADDING the bill are not the only ways a TV serviceman might "take" you. The favorite gimmick is to convince you that your set's problems are serious enough to

necessitate taking it back to the shop. Once that is accomplished, the TV trickster is free to tell you anything. □ How can you know what has been done? After several days or even a few weeks, you are so glad to have your set back that you generally swallow any story and pay whatever is on the bill. But getting the set away from you first is an art in itself.

THE SERVICEMAN'S PITCH depends on the symptoms presented by the set. For example, no picture: It could be the picture tube, he'll say, or possibly a hairline crack in a printed circuit board, or the tuner, or the power transformer. □ No sound: He'll tell you the speaker coil is burned out, or again, a crack in a printed circuit board, or the tuner. □ No picture/no sound: Could be anything. With these symptoms, the problem is likely something as simple as the fuse in the power supply, or at most a few new tubes. Yet some sharp-talking servicemen will paint so bleak a picture that they'll end up selling the customer a new set. "Of course, I'll only be able to determine the real condition of the set back at the shop," he'll say grimly, "because that's where all my test equipment is." Watch out for that line!

THE SHREWD CHEAT won't try this the first time he looks at your TV. He'll set you up by

making one or two inexpensive and simple house calls. By the time you call him the third time, he figures you're ripe to hear the bad news and consent to have him cart away your set to his shop for a "major overhaul." □ Once he gets your set to the shop, he has a few other tricks up his sleeve. A step-down transformer may be used to burn out components—resistors, capacitors, diodes, anything. He figures you'll be impressed by seeing all the damaged parts when he returns the set.

ANOTHER FAVORITE TRICK, which is often used on house calls as well as in the shop, is to replace all the tubes in sets where tube filaments are connected in series. (How this works is discussed in the chapter on tubes). □ The serviceman explains that the bad tube had short-circuited every tube in the set, naturally. And naturally, you pay $40 or $50 for a job that should have cost $8 or $10.

IF A SET has a tuner that needs alignment, the serviceman may charge you for a new tuner, either installing a new one or aligning the old one and saying he installed a new one. □ If the set has no sound and the dishonest repairman thinks you're such a fish that he can get away with it, he might charge you for a new speaker when in reality he simply put in a new audio

amplifier (much cheaper). ☐ If the problem is a printed circuit board that is cracked, he may just tin the foil side of the board with solder and charge for a whole new assembly. You look inside the set, see the shiny new solder, and take his word for it.

SUPPOSE HIS PITCH doesn't work, and you simply won't let go of the set. Maybe the man tells you that you have a burned-out part and you decide you want another opinion. No intelligent serviceman will leave himself open to a complaint that he was trying to bilk you, and you can be pretty sure that part will be burned out before he leaves. ☐ When the consultant you call in confirms the original serviceman's diagnosis, you'll be impressed that the first guy really knew what he was talking about. It's a great way to justify parts costs!

DON'T PUT IDEAS into the serviceman's head —he has enough of them there already! For example, if one area of the picture tube is more highly charged than other areas, dust may accumulate and give the appearance of a burned spot. Actually, all it needs is a cleaning. But rare indeed is the serviceman who looks at such a tube, hears you say, "Burned-out picture tube, eh?" and doesn't sell you a new picture tube. Maybe you deserve to be had!

WHAT TO DO IF YOU'VE BEEN CHEATED

☐ What if you've been grossly overcharged by a TV repairman? Or, right after the serviceman leaves (having collected his fee, of course), your set begins behaving as poorly as it did before. ☐ Repeated calls asking him to return are ignored or, worse yet, he comes back two or three times, each time doing something else to the set (and charging you, though maybe "just for parts, not labor, this time") and it still doesn't work right. What can you do?

FIRST OF ALL, make sure the repairman understands that you are not satisfied. If you think his bill is too high, say so. It's just possible that he may have done more than you realize, and has been too vague about this in his bill. Or, if you are adamant, he may adjust his bill rather than risk losing not only you but also your friends as potential customers. ☐ If this sort of friendly persuasion doesn't work (and chances are it won't, though it's worth the try), you'd be wise to send a registered letter of complaint (return receipt requested), keeping a copy of the letter for your files. ☐ If he's a

factory-authorized serviceman, send a copy of the letter to the manufacturer, too. Such a letter is not usually calculated to bring immediate results, but it puts your complaint on record, which is important if you plan further steps.

IF YOU LIVE in a state or city that has licensing regulations, now is the time to approach them with your complaint. Just about all the licensing bodies provide for suspension or revocation of a license if the licensee is guilty of fraud. But make sure you have all the facts on hand, and that you can back them up. □ While some licensing bureaus have sizable investigating staffs, others leave this chore to the complainant, and only serve as judges on the basis of your complaint and the licensee's defense. □ Of course, the mere fact that you have brought a complaint, putting his license and livelihood in jeopardy, may be enough to cause the serviceman to see it your way and redress the grievance.

MANY LOCAL police departments, especially in large cities, have a frauds bureau. Again, armed with proof of your allegations, you can take your complaint to them. □ Most states, too, have a consumer protection bureau or you can complain directly to the state Attorney General's office. Very often the wish to avoid

a court case—with the need to hire counsel, take off time from his work, and the attendant bad publicity—will bring satisfaction from the repairman where other pressures might have failed. □ But don't start something unless you are prepared to follow through. You, too, may be required to miss a day or two from work pursuing your complaint. And it's hardly fair to have the Attorney General's office spend the time investigating your complaint and drawing up a case only to have you back out at the last minute because you didn't realize that you were getting so deeply involved.

THERE ARE OTHER STEPS that you can and should take when you feel that you have been cheated. Notifying the Better Business Bureau and the Chamber of Commerce of your complaint probably won't help you directly, but it will give you the satisfaction of knowing that others will be warned away from the unethical serviceman. □ And friends and relatives who have heard of your unhappy experience with the man will hardly be likely to take their chances in dealing with him. Finally, if the dishonest serviceman uses the local newspaper to advertise his services, you can complain to the editor and advertising manager. If they get enough complaints from their readers, they may refuse to run the man's ads.

EASY TV REPAIRS YOU CAN DO

□ Until now, we've been talking about saving money when the TV serviceman repairs your set. The most substantial savings of all are realized when you are able to satisfactorily service your ailing set yourself; for the biggest bite on the TV repair bill is invariably for labor. □ Doing it yourself can also mean avoiding "down time" on your set while waiting for a serviceman to come. And that is no small consideration, especially if your children are impatiently spending a stormy weekend indoors, or if it's the day of the "game of the year" when your set suddenly decides to take a holiday.

WE ARE DEFINITELY not advocating do-it-yourself TV repairs on a large-scale basis. As we mentioned earlier in this book, such experimenting on the part of the amateur can be very costly, since it usually means a much larger repair bill from the serviceman who has to put back together what has been torn asunder by the unskilled set owner. □ But there are certain things that the amateur, with little or no knowledge of the intricacies of electronics,

can and might very well do to cure a sick set. Like the most basic troubleshooting check of all: making sure the plug is in. Sounds silly, doesn't it? Yet it is astounding how many $5 service call charges have been paid sheepishly to a TV serviceman whose only service was to plug an otherwise perfectly operating set into its wall outlet. Always check the plug first!

OF COURSE, few television malfunctions are that easily solved. Far more common are the problems caused by defective tubes. In most cases, these can readily be cured by the home-grown serviceman. It's mostly a question of knowing what to look for—which tube serves what function in the set. This will be discussed shortly, but first you have to get at the tubes. □ Most sets have their back cover fastened with a number of screws. There's no trick to removing these if you have a screwdriver. You'll save yourself a lot of extra work and aggravation, though, if you size up the situation first and remove only those screws that actually hold the back in place. These are usually located around the perimeter. Other screwheads that are visible may be holding various parts of the set to the back, and need not be removed. If they are removed, it will probably just mean trouble when you have to replace them later on.

MOST SETS HAVE a "safety interlock" which unfastens the power cord at the set when the back is removed. After you have taken out all the screws that are holding the back in place, pull the back straight out, thus unplugging the cord. When replacing the back after your successful servicing, make sure that this connection is properly made.

IT WILL PROBABLY NOT be necessary for you to remove the insides of the set from the cabinet for simple tube replacements. Should this be necessary, however, here's how to go about it: First remove the knobs and dials from the front. In most cases, you simply pull the knobs straight out. Sometimes, however, these knobs are held in place by small set screws that must be loosened first. When reinstalling either type, make sure that you match the flat surface on the inside of the knob with the corresponding flat surface of the shaft. □ The next step is to disconnect the cabinet wiring. This may include the speaker, the antenna, record player or radio attachment, and, in a few sets, the picture tube. (Before going any further, consult the following chapter on safety.) Now you simply unfasten the mounting bolts—usually four bolts located on the shelf underneath the chassis—and remove the set from the cabinet.

SAFETY AND YOUR TV SET

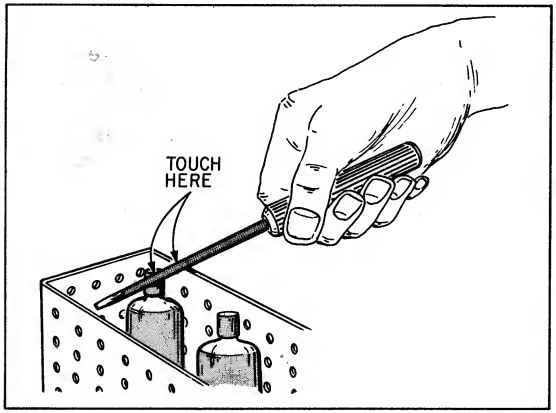
□ A healthy respect for the lethal potential of a TV set is the first safety rule for the home serviceman. It can kill. But it won't if you understand where the danger lies and use a few precautions and some common sense while you are working on the set.

AS WHEN DOING any electrical work, you should wear rubber soled shoes and work only on a dry surface. Your basement workshop with its concrete floor is not the ideal place for TV troubleshooting. If you must work there, take the trouble to build a wood platform on which to stand. □ It's far better, though, to work in the family room or living room where the set is normally located. Keep away from radiators, water pipes and other metal with which you might accidentally come in contact.

ALWAYS PULL the plug from its wall socket before removing the back cover from your set. Just turning off the on-off switch isn't enough. Wait 3 to 4 minutes after unplugging to work on the set. □ If it is necessary to use a "cheater

cord" (as will be explained later) keep your hands away from the insides of the set while the cheater is plugged in. Remember, the set is most dangerous when it is actually being supplied with power.

THE HIGH VOLTAGE section of the set is usually enclosed in a perforated metal box located in a rear corner of the inside of the set. Current can be stored up here long after the set is turned off and the wall plug disconnected. □ Should it be necessary to remove the cover of



this box to check tubes, always take the precaution of "shorting out" any remaining voltage. Use a screwdriver with an insulated handle, touching its tip to the metal grid caps on the high voltage tubes while resting the shank of the screwdriver against the metal box or some other metal part of the set. After this procedure, there will be no danger of shock. □ This shorting out procedure must be repeated each time the cover is removed after the current has been turned on. The same procedure is used to discharge current stored up in the well of the picture tube—that section where the high voltage wire enters the picture tube.

IF YOU ARE not certain that all residual current in the set has been dissipated, keep your left hand in your pocket (or your right, if you're a southpaw) while you're working. You may find it awkward at first to be a one-handed serviceman, but at least this will prevent your becoming a thruway for stray current if you happen to grasp metal with your free hand. Watch out for broken tubes.

WORK ON THE PICTURE TUBE should be left to the professional serviceman. Should it be necessary to work around the picture tube, or should you have to remove the tube for any purpose, extreme caution must be observed.

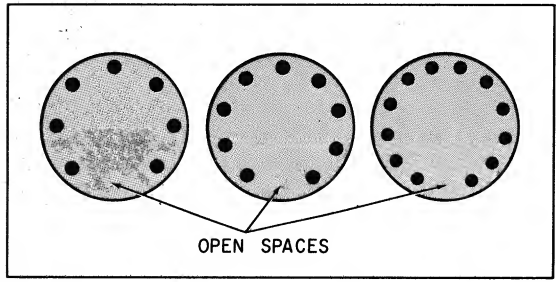
There is always present the danger of implosion. Even experienced professionals often wear safety goggles when working on a picture tube. □ The picture tube should never be lifted by its neck—the weakest part. One hand should always be placed beneath the face of the tube for support, with the other hand on the neck for balance. Before touching the picture tube, it should be shorted out as described previously. This is not because there is likely to be enough current stored to be dangerous in itself, but rather because it could give you enough of a shock to surprise you and cause you to drop the tube. □ When a picture tube has been removed from the set, it should be placed on a soft rug, blanket or other soft surface. This is not only a precaution against breakage, but also protects the face from scratching.

IT SHOULD GO without saying that children ought to be kept out of the way when you are working on your TV set. Don't ever walk out of the room and leave the set unguarded with its back off and parts scattered. □ That maze of tubes, wires, etc., is an irresistible fascination to a curious child, and this could cause serious trouble to both the TV set and the child. It is a good idea to have a family rule forbidding small children from exploring the back of the TV set.

HOW TO REPLACE TV TUBES

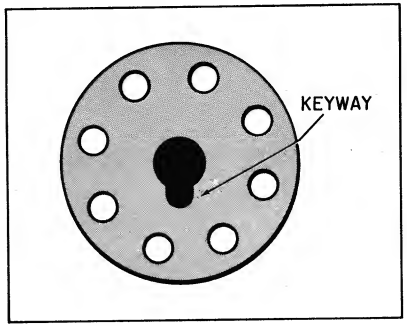
□ Looking for a bad or weak tube is not like looking for a needle in a haystack. There are certain very definite guideposts to help pinpoint the object of your search. We'll go into these shortly, but first let's take a quick look at the types of tubes in your TV set.

MINIATURE GLASS TUBES (and some new larger versions with the same basepin arrangement) are the most common type. These contain 7, 9 or 12 thin basepins, with an extra opening between two of the pins to match a



similar opening between two of the holes in the tube's socket. □ Take care when removing these tubes, as the pins are easily bent. Always pull the tube straight up and out—don't twist it sideways. Bent pins can make it difficult to replace the tube. A badly bent, flattened, or broken off pin will make it possible for you to replace the tube incorrectly, not aligning pins with holes. The result could be severely damaging to the set.

OCTAL TUBES have a Bakelite base with eight evenly spaced pins and a central key to align



the tube in its socket. To remove an octal tube, rock it gently in a circular fashion, then lift it straight up. □ When replacing the tube, check

to make sure the keyway is intact and that it is matched with the socket. Then put it in firmly.

ALL TUBES are marked with identifying numbers. The first number indicates its heater voltage. The last number tells how many internal elements are in the tube. The letters between these numbers are reference for that particular tube. The letters GT that sometimes follow the last number indicate a glass tube with an octal base. □ A suffix of A, B, C, etc., indicates improvements over the original tube—the higher the letter, the more recent improvement. As an example, a 12AX4GTB tube has a filament voltage of approximately 12 volts and contains four internal elements. It is an octal-based glass tube and has been improved twice over the original 12AX4GT tube.

AS A GENERAL RULE, tubes should only be replaced with others of the same number, but sometimes an exact replacement might not be available, or you may be able to use an improved type. Here is where your knowledge of the tube identifying system comes in. Tubes with the same type number but different suffixes (A, B, etc.) are very similar and may be interchanged, provided that the new tube has a higher suffix than the original. □ For example, a 5U4 tube can be replaced with a 5U4A or

5U4B. But the reverse is not always true. A 5U4 **may** work in place of a 5U4A, but even if it does, its life expectancy will be shorter than usual. Where there is a choice, take the tube with the highest suffix. □ Tubes which are the same except for the first numbers must never be interchanged. Plugging a 3-volt tube into a 6-volt socket, or vice versa, could cause major damage to the set.

SOMEWHERE INSIDE the cabinet of most TV sets is pasted a "map" of the set—a diagram showing the locations of the various tubes and the function that each tube or grouping serves. If you don't find this inside the set, it may be in the instruction booklet that originally came with the set. □ If you can't locate the diagram, write to the manufacturer for one, giving the set's serial and model numbers, which should be found on the back of the set.

SINCE THIS DIAGRAM tells you what tube is responsible for what function in your set, it is relatively simple to narrow down the likely trouble spots to one or two possibly bad tubes. Identical tubes may serve totally different functions in different sets, or even within the same set. Therefore, it is essential that you consult the diagram to relate the trouble with the proper tube. □ Let's consider the most common

complaints and see how they relate to the tube descriptions as given on the set diagram or the one in your instruction booklet.

No sound/no picture/no raster. After making sure that the line cord is plugged into a live outlet and the set is turned on, see that the interlock cord is properly seated in its socket. Now consult the diagram to find the low voltage rectifier system. Your trouble will likely be located here.

Sound present/no raster. First check out the high voltage rectifier tube, as indicated on the layout diagram. If this is good, check the horizontal tubes and the damper.

No sound/no picture/raster present. Before looking at the tubes, check out the antenna to see that it's in good condition and properly connected to the set. Then consult your diagram and check the amplifier and oscillator tubes on the tuner, and work your way back through the intermediate frequency (IF, as the diagram may read) amplifier tubes. One or more is probably the source of the trouble.

Sound and raster present/no picture. The video amplifier tube is probably at fault. Locate it and check it out.

Picture present/no sound. Check the audio amplifier tube, the audio preamplifier and the discriminator, as identified on the diagram.

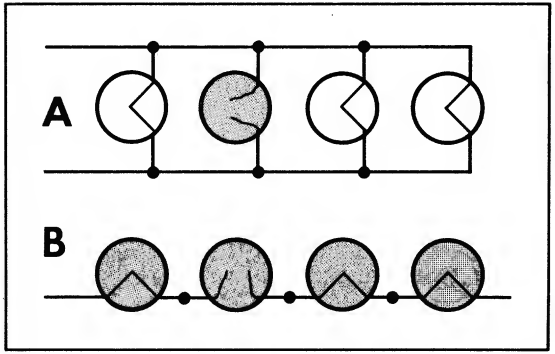
Picture flops. When you can adjust the vertical hold control to make the picture roll upwards or downwards but you can't make it hold still, the trouble will most likely be found in one of the vertical sync tubes, or in the sync separator. Again, locate these on your diagram and check them out.

Picture tears. When lines extend diagonally across the screen splitting the picture and you can't lock it in with the horizontal hold control, the problem is in the horizontal sync tubes, or in the sync separator.

Shrinking picture. If you can't adjust the width control to fill out the screen, the problem is likely to be found in the horizontal amplifier or the high voltage rectifier.

AS YOU probably know, each tube contains a fine wire filament similar to that found in a light bulb. Electric current passing through this filament produces heat, which causes the filament to glow. Obviously, if the filament burns out or breaks, no current can flow through; the tube remains dark. Thus, a single

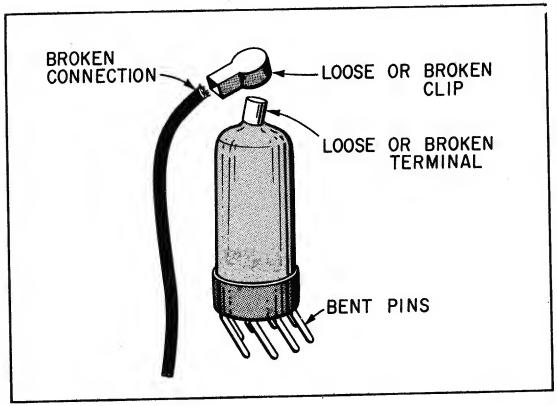
dark tube in the general area of the set where you have pinpointed the trouble may be the cause of the problem. □ Unfortunately, this is not always the case. TV circuits are wired



in either of two ways: The more common is to connect the tube filaments in parallel (A in the drawing). In this case, if a single tube burns out, it goes dark but all others remain glowing. But many sets are wired with tubes connected in series (B). In this case, all the tubes will go dark when one tube goes bad. □ Often, the defective string in your TV set may contain tubes in various sections of the set. As a result, a single bad tube can cause several unrelated circuits to become inoperative, making the

diagnostic job more formidable. ☐ It will then be necessary to check out all the darkened tubes. One way to determine if your set is wired in series is to refer to the diagram. Tubes beginning with numbers 3, 4, 8, 10, 14 or higher generally indicate series wiring.

THERE ARE a few other visual checks you can make to determine whether or not a tube is defective. Badly bent or broken pins are a sign of trouble. Some tubes have top terminals to which wires are attached by means of clips. A loose or broken terminal means trouble, as



does a loose or broken clip. ☐ Make sure, too, that the wire itself is securely fastened to the clip. A purple glow inside a tube indicates a possible gassy condition, rendering it defective. This can be checked out on a tube tester, as discussed later. A purple tint on the glass itself, however, is usually not serious, nor is it a sign of trouble.

ANY TIME you wish to visually check the tubes by observing the set in operation with the back off, you will have to bypass the safety interlock feature of the line cord. This is done with a cheater cord, which may simply be a cord that has been detached from the back of an old TV set, or one purchased from an electronic supply house. There's no danger in using a cheater if you adhere strictly to one rule—look, don't touch, whenever the set is in operation. Remember—look, don't touch!

JUST BECAUSE a tube lights doesn't mean that it isn't causing your problem. A weak tube, rather than a completely bad one, may be at fault. Weak tubes should always be replaced. You may be able to adjust controls to compensate for weak tubes by overtaxing the good ones, but this just means more trouble in the long run. For best performance, replace tubes as soon as you spot a weakness.

WHEN YOU ARE replacing tubes in the set after you have removed several for testing, it is important to consult the diagram as you insert each one. A 9-pin tube, for example, may fit into several different sockets, but it only belongs in one. Putting it into the wrong socket won't solve any problems, it will likely damage the tube and possibly the set. □ Here's another hint about replacing tubes. When you remove two tubes with the same identifying number, make sure you replace each in the same socket from which it came after tests are completed. This will probably save you the necessity of making adjustments when the set is working again. No two tubes are exactly alike, and the set has been adjusted to accommodate the original tube arrangement. □ One way you can insure your putting them back where they came from is to wrap a piece of masking tape around each tube as you take it out, marking it to correspond with a number you mark on the diagram.

THE BEST THING to do with old tubes is to throw them away. They just take up space on your workshop shelf. If you want to keep a replaced weak tube for emergency use, keep it well separated from new tube stock. If you mistakenly use a weak tube to replace another weak tube, you just compound the confusion!

HOW TO TEST TV TUBES

□ The best and surest way to "test" a suspect tube is to replace it in the set with a new, good tube. If the problem is cleared up, it's a pretty safe bet that the old tube was bad. This is the method favored by professional servicemen, but unfortunately it is not always practical, even for the pro who may carry along a supply of several hundred replacement tubes.

SO, IF YOU SUSPECT that one or more tubes may be causing your TV set's troubles, your next best bet will probably be the "drug store" tube tester. One can usually be found just around the corner no matter where you live, at such diverse establishments as hardware stores, supermarkets, and even gas stations, as well as drug stores. □ While this type of tester is widely scorned by the more sophisticated members of the electronics fraternity, it can be a very valuable diagnostic tool—if you recognize its limitations.

THE CONSOLE TYPE of tube tester is not infallible. There are certain tube characteristics

that it is not equipped to test, so it might give a reading of Good to a tube that is actually defective. More common, perhaps, is a reading of Weak or Bad for a tube that is still strong or good enough to perform perfectly well in your set. □ Too, the tester may simply be inaccurately adjusted, or you might make a mistake in setting it up for your test, resulting in a false reading. You can double-check this last possibility by also testing the new replacement tube to see if it also gives a Bad reading.

DESPITE THESE SHORTCOMINGS—and especially if you have an understanding of them—the drug store tube tester will probably catch the culprit in the great majority of your problem tube cases. In addition to testing the tube's power, the tester will also check it out for shorts and gas. □ Some tubes will indicate Short even when they are perfectly all right. This is inherent in the design of certain types of tubes, and should be noted on the tester's instruction chart, along with a list of such tubes. For most tubes, however, a Short or Gas reading means replacement is indicated.

IF YOU HAVE A BIG SET, or an old set that is likely to require more and more tube replacements, or if you simply get hooked on the idea of being your own TV repairman (within limits,

of course), you would be wise to invest a few dollars in an inexpensive portable tube tester. □ They can be purchased from an electronics supply house, such as the ones listed in the classified section of your phone book, or those mail-order firms whose addresses are given in the section on "Where to Buy TV Tubes" in this book. □ These hand-sized units allow you to make a quick, on-the-scene test for a burned-out filament. Most of the low-priced models do not indicate whether a tube is simply weak rather than bad, but since burn-outs account for about half of TV tube troubles—and even more when the problem is a non-operating set—you can understand what a valuable tool this can be. Some models enable you to check tubes for internal leakages or short circuits. With some, you can even check out your picture tube.

THERE IS ONE FINAL TEST that deserves mention, along with a word of caution. That is the touch test. This will work on a set that is wired in parallel. Simply turn on the set and allow it to warm up for about three minutes. Turn it off, unplug it from the wall outlet, and short out any remaining voltage from danger spots as described in the section on safety. Then feel the tubes in the suspect area to see if they are warm. If you find a cold tube, you've probably found the source of your problem.

WHERE TO BUY TV TUBES

☐ Tubes are available at many places and at many prices. Just about any drug store, stationery store, hardware store or department store that has a tube tester also sells tubes, sometimes at a discount. For a tube that lists at $4, you may pay $4, or you might get as much as 20% off: $3.20. From an electronics supply house, you may get the same tube as cheaply as $1.50. ☐ So you see that it pays to shop around. Listed below are some of the larger mail-order electronics supply houses. Write to them for catalogs and prices.

Allied Radio Corp.
100 N. Western Ave.
Chicago, Ill. 60680

Hawthorne Electronics
3580 S. E. Hawthorne
Portland, Ore. 97214

Lafayette Electronics
111 Jericho Tpke.
Syosset, N.Y. 11791

Olson Electronics
260 S. Forge
Akron, Ohio 44308

Radio Shack Corp.
730 Commonwealth
Boston, Mass. 02215

Sun Parts & Hi-Fi
514 10th St. N. W.
Washington, D.C. 20004

HOW TO REPAIR AND MAINTAIN A TV ANTENNA

☐ If your TV set consistently shows signs of "ghosting" or "snow," or if your search for faulty tubes has not appreciably improved the set's performance, a primary suspect must be the antenna, or perhaps the entire antenna system. Just because you've got the highest mast on the block sprouting from your chimney, with a bewildering but impressive array of cross-arms aiming in all directions, doesn't mean that that antenna is giving you the kind of reception your set is capable of. ☐ Even if it was perfection when it was first installed, time takes its toll, a severe one in the case of outdoor antennas.

THE SIMPLEST TYPE of antenna is the familiar "rabbit ears" located atop the TV set or at some other location nearby. In certain areas where the television signal is exceptionally good and strong, such an indoor antenna may be enough to assure fine reception. ☐ There are many versions of indoor antennas, some of which are very sophisticated instruments. However, the very fact that it is indoors means

that the antenna is shielded from the path of the TV signal by such surrounding metal as water pipes, electrical conduit in the walls, and perhaps even metal siding. In large apartment houses, steel-beam construction may contribute to the problem. □ Signals that are received by the antenna are reflected off the surrounding metal, resulting in picture problems. The antenna must be moved frequently to find a spot where this reflection is minimized for a given signal.

INSTALLING AN ANTENNA in the attic generally works very well. If the small, rabbit-ear type works when you try it in the attic, that's fine. The more complex types that are generally used for roof installations may also be installed in the attic, provided, of course, that there is sufficient room—not always the case in ranch homes with low-pitched roofs. □ In the attic, the problem of surrounding water pipes and conduit does not exist. Furthermore, you don't have to worry about the effect of the elements on the installation. And, if you are at all handy and are interested in saving a few dollars, you can usually install such an antenna yourself.

THE MOST COMMON TYPE of TV antenna is the collection of pipe and tubing that clutters

the sky above just about every residential neighborhood and isolated farmhouse in the country. The forms that these take are many and varied, and we wouldn't, or couldn't, begin to discuss the myriad types that are available, or to recommend which is best for you. There are simply too many variable factors involved, and when it comes to choosing a rooftop antenna, all we can suggest is that you consult a reputable, knowledgeable professional and be guided by his advice. If you know of a man who has done several satisfactory installations in your neighborhood, you can consider this a good qualification.

IF YOUR LOCATION or your whim is such that you wish to pick up a TV station over a great distance, you will most likely need a very high mast or a tower, possibly equipped with an amplifier and a rotator. □ In such an installation, wind is the greatest problem. Make sure that the contractor who does the job includes enough guy wires to withstand the most severe winds likely to be encountered in your area. The Electronic Industries Association recommends that antennas be installed to withstand 110-mph winds in all areas of the U.S. except the tornado and coastal areas where, of course, the figure would be considerably higher. □ Be sure that whoever is in-

stalling your mast or tower understands this. If you are planning to make such an installation yourself, we strongly urge you to consult a professional about anchoring requirements in your area.

IF YOU SUSPECT that your TV problems are antenna-caused, check out all connections and the lead-in (more on this in the next chapter). With an indoor antenna, you shouldn't have much more than this to worry about, and if you still have problems, maybe you need a higher, outdoor antenna. Often, a new building in the neighborhood will make it more difficult to pick up TV signals, requiring you to install a new antenna.

FOR AN OUTDOOR ANTENNA, you should follow a program of periodic maintenance to avoid problems, just like having your furnace cleaned every fall, or seeing your dentist twice a year. An annual Spring checkup is a good idea. □ When you do have problems that seem antenna-connected, chances are that they can be checked out the same way. If your home has a gently sloping roof, if you have no fear of heights and are fairly steady on your feet, there's no reason why you shouldn't be able to get up there and check it out yourself. □ But if you have a steeply pitched, tile roof, or if

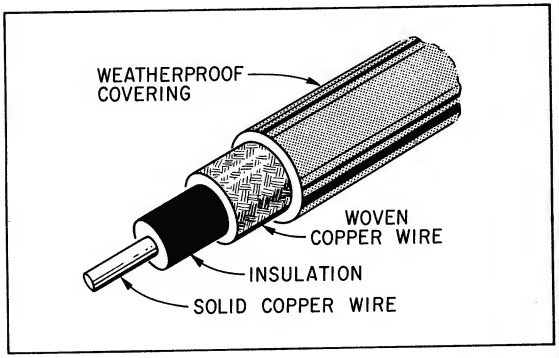
you're the type who shies away from standing on a step stool to replace a ceiling light bulb, call in a pro.

PROBABLY THE GREATEST ENEMY of your outdoor antenna is oxidation. Just about all outside antennas are made of aluminum which, when exposed to the air for a period of time, develops a coating of aluminum oxide, shutting out part of the TV signal. This is a particular problem in coastal areas where the air has a high salt moisture content, as well as in other humid climates. □ Industrial pollutants in the air, as well as chimney soot, also spell bad news for the antenna. If oxidation is well advanced, it's best to replace the antenna. Otherwise, it can be cleaned off with steel wool or fine sandpaper. Be especially thorough in cleaning the terminal areas where the wire is attached. Clean the insulation with carbon tetrachloride. □ When the antenna is thoroughly cleaned, give the metal sections a coat of aluminum paint to retard further corrosion.

IF THE ANTENNA is loose in its mounting, tighten it securely. If high winds have disoriented the antenna, realign it in the proper direction to pick up the signal. If the antenna has been badly bent or otherwise damaged, it should be replaced.

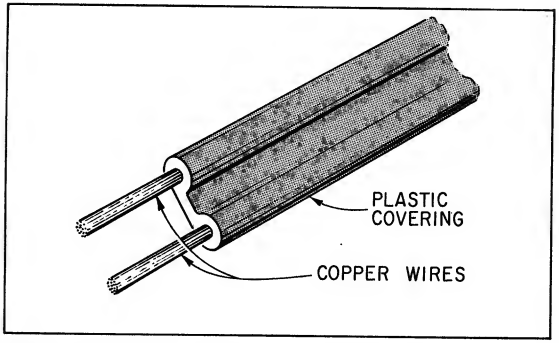
LEAD-IN WIRE AND COAXIAL CABLE

☐ Lead-in wire connecting the antenna to the television set is of two basic types. Coaxial cable is heavy-duty wire that is just about



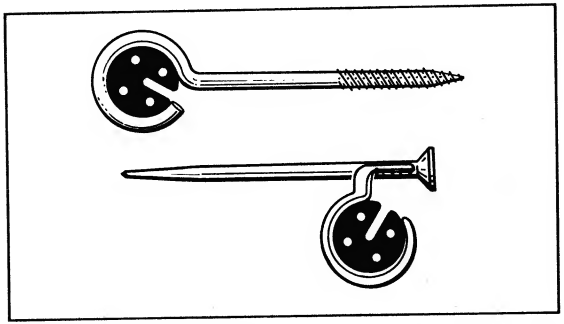
immune to interference. Although it is generally recommended for use with color TV, it seems to be fast disappearing from the scene because of its high cost and difficulty in splicing. ☐ Far more familiar to most set owners is the flat twin lead-in wire, which is generally

satisfactory and far less expensive than coaxial cable (shown below).



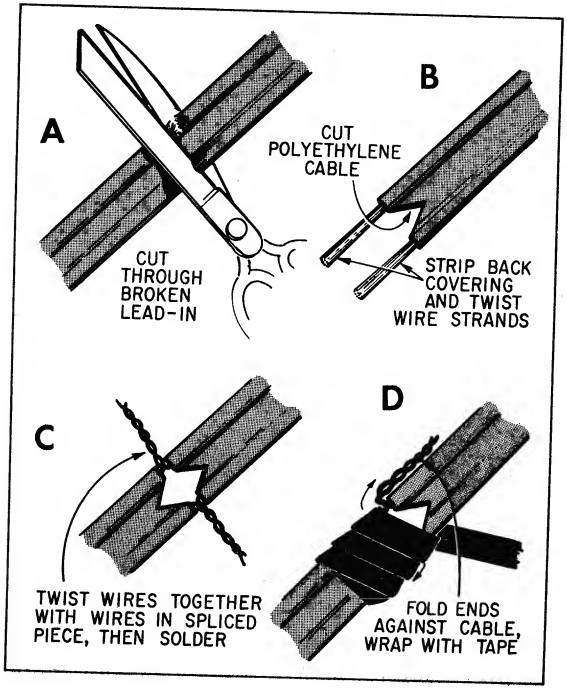
THE HEAVILY insulated coaxial cable can be fastened directly to the antenna mast and the house siding as it is led to the set, but this is not possible with twin lead. Standoff insulators of the type shown on the following page are used to keep such lead-in far enough away from any possible obstructing factors. ☐ Make sure there are plenty of these standoff insulators on your lead-in wire to keep it from being whipped about in the wind, which could cause picture flutter as well as damage to the lead-in. One insulator about every four feet is good, with two or three used at every turn. ☐ Lead-in wire should never make a sharp bend; gradual,

sweeping turns are best, with enough standoff insulators to hold it in position.



ASIDE FROM loose connections at either end of the lead-in and improper anchorage along its length, it should be checked occasionally for worn or frayed insulation. Flat twin lead-in wire tends to become brittle with age, and rubbing against a gutter or even the side of the house could cause the insulation to wear away, and possibly even break the wire. Frequently, a lead-in problem can be corrected simply by wrapping a frayed area with tape. □ If the lead-in is broken, you can splice in a new piece as is shown on page 55. Then put a standoff insulator at that spot to protect the repair. □ A simple trick to improve picture quality is to wrap a strip of aluminum foil

about 3 inches wide tightly around the flat antenna wire about 3 feet from the set. Squeeze the foil tightly and slide it slowly along the wire until the picture is at its best.



HOW TO USE THE CONTROLS ON YOUR TV SET

☐ Frequently a picture problem is caused by improper adjustment of controls. Those controls you can see include the on-off and volume control, the channel selector, the fine tuner and the contrast control. Although they may be out of sight on the back of the set, the brightness, vertical hold and horizontal hold controls may also be included in this group. ☐ Inside the set are a number of other controls, which are adjusted initially when the set is installed and then not usually touched. These may need adjustment as the set ages or outside factors change. They include the horizontal frequency control, automatic gain control, sync stability control, horizontal and vertical size controls, horizontal and vertical positioning and linearity controls. Not all sets have all these controls. The diagram inside your set probably shows their locations, or the controls themselves may be labeled.

OF THE "OUTSIDE" CONTROLS, the fine tuner is perhaps most neglected. Use it to produce a sharp, clear picture of extremely fine detail.

The contrast control should be adjusted for the most visually pleasing difference between light and dark areas in the picture—a compromise between highlights of black and white with very little gray shading and a completely gray picture without any sharp distinctions. ☐ The brightness control is adjusted along with the contrast control to give the best possible picture. If set too high, the image appears washed-out; at the other extreme, the screen is completely blacked out.

THE VERTICAL HOLD is adjusted to prevent the picture from flopping. You can also improve your picture with this control. Look at the screen and note the fine horizontal lines running through the picture. Slowly adjust the vertical hold control to a point just before the picture begins to flop, and the lines will become indistinct, giving a clear picture. ☐ The horizontal hold control, also called the horizontal lock, prevents the picture from tearing, or separating diagonally.

ADJUSTING the back-of-the-set or hidden controls may cause more trouble than it cures, so make sure you fully understand what effect your adjustments will have on the picture before you start. Bear in mind that some of these adjustments will have to be made with the back

of the set removed and a cheater cord being used to bypass the interlock.

THE HORIZONTAL frequency control, sometimes called the ringing coil, may require adjustment if ghosts on your screen cannot be eliminated by reorienting the antenna. Use an insulated screwdriver to adjust the ringing coil carefully, while observing the screen to see if this has an effect on the multiple images. □ If the images increase, adjust in the other direction until they merge with the main picture and the ghosts are exorcised.

THE AUTOMATIC gain control (sometimes labeled AGC), allows you to tune different channels having various signal strengths without necessitating readjustment of contrast and volume controls each time. If improperly adjusted, a strong signal will cause excessive contrast in the picture and a hum in the sound. □ To adjust, tune in the strongest channel and rotate the control clockwise until you hear excessive hum and notice excessive contrast. Then rotate the AGC counterclockwise until the picture becomes normal. The control is then set to hold constant on all channels.

THE SYNC STABILITY control prevents noise in the picture signal from causing a bending of

the image at the top of the picture pattern. □ To adjust this control, first make sure that the automatic gain control is properly set, then turn on the strongest local channel and rotate the control counterclockwise until the picture bends at the top. Now simply back off until the picture straightens.

THE WIDTH or horizontal size control allows you to expand or contract the picture, but be careful that you don't overcorrect to the point of distortion. While adjusting, watch the picture as well as the sides to make sure that you don't end up with only short, fat people on your screen. □ The horizontal linearity control changes the horizontal radius of the picture from the center to either side. To adjust, rotate the shaft until the horizontal radius of the picture from the center to one side is equal to that from the center to the other side. In most sets, this adjustment must be accompanied by adjustment of the horizontal size control. □ A mirror propped on a chair is useful in adjusting the picture while working in the set.

THE HEIGHT or vertical size control (also called vertical drive control) determines the overall height of the picture. Any adjustments to this control must be made in conjunction with the vertical linearity control, which deter-

mines the vertical symmetry of the picture. If you adjust the vertical size for correct picture height, you must compensate by adjusting the linearity to keep everything in relative proportion.

PATIENCE is the byword when adjusting any of these controls. It must be done slowly and methodically. And we can't overemphasize the importance of safety whenever you are working inside the set. A control may be located in a hard-to-reach spot, and care must be taken that you don't brush against a hot tube or high voltage area, and that your screwdriver doesn't slip and damage the set, or perhaps even cause the picture tube to implode. □ But, with these things in mind (and one hand in your pocket, remember, so that you don't accidentally make an unfortunate contact) you should be able to make the adjustments that will give you a near-perfect TV picture.

SOMETIMES YOU MAY experience interferference over which you have no control. This may stem from power tools, automotive ignition, industrial machines, ham radio operators, aircraft—even electric light bulbs. If adjusting the fine tuner doesn't correct these problems, have your serviceman install an interference filter at the tuner of your set.

TIPS FOR BETTER TV RECEPTION

□ Obviously, the most important factor in locating your TV set is to put it where the entire family can view it comfortably. You may find a spot where the picture is perfect, but if the viewers must flatten themselves against a wall to watch it, or sit in a tree or stand on their heads, your great picture is for naught. Fortunately, it usually works out that placing the set with its back to the wall not only provides a satisfactory picture, but also permits a furniture arrangement that gives everyone a good view of the screen. □ But keep the set at least a few inches away from the wall. A lot of heat is generated by the tubes and other components. Ventilating holes in the back cover are there to let the heat escape; this won't be possible if the set is pushed tightly against the wall. For the same reason, keep it away from drapes and curtains.

IF THE LAYOUT of the room is such that you can conveniently locate the set "kitty-corner," this is generally a good arrangement, permitting a wide viewing radius as well as keeping

the set from coming too close to the wall. □ If possible, choose a relatively dark corner of the room where windows and lamps will not cast reflections on the screen. A TV light—not too bright and located either behind the screen (as atop the set), or elsewhere in the room where it will not reflect on the screen—is recommended to avoid tiring the eyes. □ Avoid a location where direct rays of the sun will strike the screen. Aside from making daytime viewing difficult, these rays will damage the tube itself, causing a yellowish picture, and ultimately requiring replacement.

ANOTHER LOCATION to avoid is near a radiator or heat register. Not only would the set tend to block off heat from proper circulation throughout the room, but the heat would also damage the cabinet and generally shorten the life expectancy of the set. Enough heat is generated by the set itself without subjecting it to superheating. □ Still another consideration in locating the set is the distance from the antenna. The length of the lead-in wire should be kept as short as possible. This is especially important in fringe areas, or in areas where reception is generally poor for any reason.

IT IS RECOMMENDED that you try locating the set in several different areas of the room.

Particularly if you are depending on a built-in antenna, you should experiment with the set in this way. You will probably find that you get the best reception on an outside wall, but this is not necessarily the case. □ You may even find that you do best with the set dead center in the room. And if the room's dimensions are such that you can group several chairs at a comfortable distance in front of the screen and still be able to utilize the area behind the set for whatever useful purpose, then why not just leave the set there?

IT MAY HAPPEN so gradually over a period of time that you scarcely notice it, but a definite loss of brightness and picture clarity can be caused by dust on the face of the picture tube —not just smudges on the front of the set but on the tube itself. □ Since the face of the tube is charged with static electricity, it serves as a dust precipitator. Brownish dirt accumulates on the face of the tube behind the safety glass. (This problem has been eliminated on many newer sets which incorporate a clear plastic shield molded directly to the face of the picture tube making a solid, air-tight assembly.) In fact, if one area of the tube is more highly charged than others, this dust accumulation may look like a "burned" spot, leading you to suspect that the tube needs replacement. □ Be-

fore you despair, remove the safety glass (on many sets, removing a few screws lets you pull away this glass plate; on others it may be necessary to remove the set from the cabinet and approach the job from within) and clean the tube face and the inside of the glass with window cleaner. □ And don't forget frequent cleaning of the outside of the glass protecting the picture tube. It makes a difference!

ANOTHER dirt problem is the tuner. This is especially true in urban areas, where air pollution poses many problems beyond that of TV interference. If you must tap or jiggle the tuning control to bring in the sound and the picture, this is a sure symptom that oxidation is affecting the tuner. □ Remove the set from the cabinet and remove the cover from the tuner. Use a soft cloth and a good contact cleaner (available at electronic supply houses) to carefully polish the silver contacts. At the side of the tuner are spring contacts, which should also be cleaned, but with extreme care, for they are very brittle.

WHENEVER YOU HAVE occasion to remove the set from the cabinet, dust off all the tubes with a soft, slightly dampened cloth. The removal of accumulated dust will permit the tubes to cool faster, and therefore to last longer.

What does your TV serviceman charge to replace a $2.25 tube:
☐ $9? ☐ $15? ☐ $18? ☐ $21?
If he is honest, the charge is $8–$10 (including service call and labor). If he is dishonest, the "average" charge is $20.95* (most of it for extra parts and labor your set doesn't need!)

Don't be cheated on TV repairs! Learn the symptoms that indicate your set needs only minor work. Learn when not to allow your set to go into the shop. Learn what easy repairs you can do at home.

**Based on the results of a test conducted by the Bureau of Consumer Frauds and Protection of The Office of The Attorney General of the State of New York and CBS News*

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